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ABSTRACT

The growth and development of the pedagogical schemata of 16 midwestern preservice teachers in a graduate-level, secondary alternative certification program was studied by examining: (1) pedagogical knowledge comprising the schemata as the program began; (2) pedagogical knowledge comprising the schemata at the end of student teaching; and (3) trends and changes in the participants' pedagogical schemata as they interacted with the program. Subjects were guided by a conceptual framework of classroom decision making. They engaged in reflective activities (interdisciplinary seminars, journal writing, and concept mapping) and participated in coursework, a practicum, and student teaching. Data were collected throughout. Subjects showed four stages of pedagogical development (atheoretical, theoretical, integrated, and practical schemata). Results suggest the importance of: (1) having professional teacher preparation before entering the classroom; (2) helping preservice teachers construct an initial cognitive framework of theoretical knowledge early in their pedagogical development; and (3) offering alternative teacher education to help chart the growth of preservice teacher pedagogical knowledge over time. Three sources of knowledge were seen to contribute to pedagogical development of graduate-level preservice teachers: theoretical principles, practical knowledge and wisdom, and personal prior knowledge of teaching. A list of 31 references is included. (SM)

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The development of pedagogical schemata in alternative preservice teachers

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Introduction

An increasing number of teacher education scholars are focusing their attention on alternative ways of preparing and certifying classroom teachers. Partly in response to criticisms of traditional programs (L[illegible]e, 1987) and partly in response for recruitment of exce[illegible]achers in specific subject areas (for example, see Hawk & Schmidt, 1989), a university-based, alternative teacher certification movement has emerged. Though some alternative programs have been developed for undergraduate students (Barnes, 1987), most of these programs, particularly those with a central organizing theme or concept, are designed for persons who have been in professions other than teaching, for parents who have assumed family responsibilities for several years and have delayed their professional goals, and for those who recently completed a baccalaureate degree in a major other than education. Alternative programs enable these and other nontraditional students to become certified teachers through a specially designed curriculum in approximately one academic year.

As the alternative movement continues to gain momentum, questions of how to more efficiently and effectively prepare preservice teachers for classroom instruction have become salient (Powell, 1990). For example, given the shorter duration of most alternative programs, what types of pedagogical knowledge do these preservice teachers acquire during their preparation? How do they use this knowledge for lesson planning and teaching? Given that some preservice teachers in alternative programs have been in other professions for extended periods, how do their prior work schemata

and experiences influence their lesson planning and teaching? Focusing on these and related questions, the purpose of this inquiry was to explore the growth and development of pedagogical schemata over time in one cohort of preservice teachers being prepared by a graduate-level, secondary alternative certification program.

Research Context

Theoretical Framework

This investigation was developed from the literature on schema theory, on the professional knowledge base of teaching, and on alternative teacher certification programs, most particularly programs developed around a theme or conceptual framework such as "Teacher as Broker of Scholarly Knowledge" (White, 1987). Anderson's (1984) notion of a schema provided the construct needed to theorize about pedagogical development and knowledge acquisition for the preservice teachers in this study (see also Neisser, 1976). Following Anderson, a schema was defined as an "abstract structure of information [in memory] that summarizes information about many particular cases [and] can be conceived as consisting of a set of expectations" (1984, p. 5).

Some alternative teacher education programs, particularly those containing a central organizing theme, are fostering growth of well developed schemata (Barnes, 1987). Though reports have emphasized the importance of alternative programs (Borko, McCaleb, Arends, Garner & Mauro, 1987; Short, 1987; White, 1987), research is limited on pedagogical development over time of preservice teachers in these programs. However, studies suggest that when

various dimensions of pedagogical knowledge are assimilated by preservice teachers, the growth of well developed schemata is possible during their preparation (Barnes, 1987; Berliner, 1987; Shulman, 1987; Wilson, Shulman & Richert, 1987). Dimensions of pedagogical knowledge that can help form a foundation for constructing well developed schemata include subject specific pedagogical knowledge (i.e., pedagogical content knowledge), general pedagogical knowledge, subject matter knowledge, knowledge of curriculum development and implementation, and practical knowledge and wisdom of the school classroom (Shulman, 1986; Wilson, et al., 1987).

To better understand the kinds of knowledge that graduate-level preservice teachers in alternative programs do acquire as they are prepared, this exploratory study examined the kind of pedagogical schemata that developed in one cohort of alternative preservice teachers. More specifically, the study asked, what pedagogical knowledge comprises preservice teachers' schemata at the beginning of the program (i.e., entry-level schemata)? What pedagogical knowledge comprises preservice teachers' schemata at the end of the student teaching? What emergent trends and changes occur over time in preservice teachers' pedagogical schemata as they interact with all phases of their alternative program?

Participants and Setting

Participants in this investigation were a cohort of sixteen graduate-level preservice teachers in a secondary-level alternative certification program at a large midwestern university. Ages of preservice teachers ranged from twenty-two to forty, with a mean

age of 28.7. All had bachelors degrees in their area of specialization, four held masters degrees and one held a law degree. None had been involved with teacher education before entering the program. All had strong academic backgrounds and in screening interviews for the program, all demonstrated high levels of interpersonal skills. Most of the participants exceeded state certification requirements for coursework in their subject area (i.e., Physics, United States History, German). Only a few needed additional arts and sciences courses for certification. Applicants admitted to the program received a fellowship and tuition for up to thirty-nine hours of coursework.

Preservice teachers moved through the twelve to fourteen month program as a cohort experiencing a common core of coursework and field experience that was guided by a conceptual framework of classroom decision making (Bennett & Powell, 1990). An underlying assumption of this framework was that the integration of theory with practice fosters informed classroom decision making. Preservice teachers were also exhorted to engage in a series of reflective activities throughout the program including concept mapping (Beyerbach, 1988), stimulated recall interviewing (Borko, Livingston, McCaleb and Mauro, 1988), personal journals (Bolin, 1988), and interdisciplinary seminars. The purpose of these activities was twofold: to integrate theoretical pedagogical knowledge of the university context with practical pedagogical knowledge of the classroom context throughout the program; to foster individual self reflection and awareness of pedagogical development for preservice teachers.

Phases of the Program

Phase One of the program was held on the university campus where preservice teachers completed six hours of education coursework and took arts and sciences coursework needed for certification. One of the education courses was an interdisciplinary seminar focusing on general pedagogical knowledge (i.e., principles of teaching and learning). The other education course specially designed for the program, Psychology of Teaching and Learning, was taught by an educational psychologist and used case studies of classroom teaching as a central focus for examining the psychology of classroom decision making.

In Phase Two, preservice teachers completed an extensive semester-long practicum, took additional education coursework and arts and sciences as needed. The practicum required students to be in both middle school and high school classrooms for at least eight hours each week. As the capstone experience of the practicum, preservice teachers taught a ten day unit in one of the classes they were observing. The education coursework in Phase Two included a seminar in multicultural principles of teaching (Bennett, 1986) and a subject-specific methods course. Though the cohort of preservice teachers participated together in the seminar, a course that was designed for the alternative program, they completed the methods course with preservice teachers in the traditional teacher education program.

Phase Three included fifteen weeks of closely supervised student teaching. In student teaching all participants were videotaped twice for self-analysis of classroom teaching and for

stimulated recall interviewing. In Phase Four, the cohort returned to the campus following student teaching to complete their final six hours of education coursework and any remaining arts and science courses needed for certification. The education courses included reading at the secondary level and social and philosophical foundations of education. Both courses were designed especially for the program.

Methodology

Data collection began the first day of the program and ended with the completion of student teaching, approximately eleven months later. Sources of data were field observations, concept maps of teaching, personal journals kept by preservice teachers throughout the study and stimulated recall interviews of lessons taught to peers early in the program and of lessons taught in the school classroom. Data were collected from the whole cohort (i.e., group data) and from five case study preservice teachers (i.e., case study data).

To examine the idiosyncratic nature of schemata that developed, five case study preservice teachers were selected using Yin's (1987) literal replication design. Preservice teachers were selected if they had no prior teaching experience in school settings (i.e., substitute teacher, guest speaker). Of preservice teachers selected for case studies, Greg and Kent, two social studies majors, and Carol, a mathematics major, were making clearly defined career changes. Molly, an English major, had just completed her baccalaureate degree and selected teaching as a first career. Larry had completed a degree in chemistry several years

before applying to the program. However, he had not held an ongoing position in a professional capacity and chose teaching from various other professions he could have entered.

Four sets of concept maps of teaching were collected from all members of the cohort. Prior to developing their first map, preservice teachers were given instructions on developing concept maps of teaching. They were asked to first brainstorm categories and subcategories of words associated with teaching and second, to organize these words into superordinate and subordinate concept hierarchies (see Beyerbach, 1988, p. 341).

Map 1 was collected the first day of the program, Map 2 at the end of the first summer, Map 3 following the fall practicum, and Map 4 toward the end of student teaching. Figure One Shows a map developed at the beginning of the program by one of the preservice teachers. An item analysis was performed on all maps. For this analysis, frequency counts were made of items on maps. This type of analysis provided (1) a means to check the predominant vocabulary of preservice teachers at various points in the program, (2) a list of concepts that were part of preservice teachers conceptions of teaching at specific points in time, and (3) a way of comparing the pedagogical vocabulary of preservice teachers with the vocabulary related to the university coursework and the school classroom. These three functions of concept maps provided a view of the nature of the pedagogical concepts preservice teachers were acquiring as they were prepared by the program.

Insert Figure One about here

Four stimulated recall interviews were conducted with the case study preservice teachers (see Appendix A). Following the stimulated recall strategy of Borko, Livingston, McCaleb and Mauro (1988), all case study preservice teachers were videotaped during a short peer lesson taught the first week of the program, during one of their lessons of the ten-day teaching portion of the practicum and during a lesson early in student teaching and a lesson late in student teaching.

Two observers, the investigator and the director of the alternative program, worked as co-researchers to independently record critical incidents or saliencies (CISs) that occurred in preservice teachers' lessons as they were videotaped. Critical incidents were unanticipated events or particularly noticeable activities in the lesson that implied interactive decision making (Bennett & Powell, 1990). Saliencies were trends or themes in the lesson that suggested prior lesson planning of preservice teachers. CISs that were independently coded by both observers were used during the stimulated recall interview to probe case study preservice teachers' thoughts and underlying pedagogical knowledge during the lesson. One CIS was deemed sufficient for the stimulated recall interview of the shorter peer lesson at the beginning of the program and three CISs were used for conducting interviews of the remaining lessons taught in school classrooms. All interviews were audio taped and transcribed for further

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analysis.

Using the constant comparative method of data analysis (Goetz and LeCompte, 1981), all data were continuously explored and compared with previously collected data to detect trends of pedagogical development. As trends emerged, new data were used to refine existing trends or generate new trends. As a means of establishing credibility of the study (Lincoln & Guba, 1985), the researchers held peer debriefing sessions throughout the study. These sessions served to check on observer/interviewer bias, to discuss trends within and between interviews, compare recent with earlier data collected in the study and to compare holistic impressions of the researchers. Moreover, peer debriefing helped ensure reliability between interviews and establish credibility of findings (Lincoln & Guba, 1985).

From the data analysis four stages in the development of preservice teachers' pedagogical schemata were detected. A model of the changes in schemata over time emerged from these stages. The stages and the model are described below.

Stages of Schema Development

As the cohort of preservice teachers was prepared by the alternative program, the group exhibited four stages of pedagogical development. Shown in Figure 2, these stages describe the pedagogical knowledge that preservice teachers had in their entry-level schemata and that they constructed throughout the program.

Insert Figure 2 about here

Stage 1: Atheoretical Schemata

Concept maps developed by preservice teachers the first day of the program and stimulated recall interviews of microteaching lessons taught the first week of the program revealed that on the whole, entry-level schemata were idealistic and atheoretical. At the beginning of the program, preservice teachers were professionally naive about students and schooling. Though they had general notions of the teaching/learning process that any person entering teaching might have, none of their entry-level maps contained items pertaining to classroom roles or to personal features of students. Preservice teachers appeared to be mostly unaware of what students do or should be able to do in the classroom. Hence, as the cohort entered the program, they were technically uninformed and naive about students and about classroom dynamics. Theoretical knowledge pertaining to teaching was essentially lacking from their entry-level schemata.

Toward the end of student teaching, each preservice teacher examined their maps and described how they changed. They were also asked to summarize each map with one or two words. By and large, their descriptions of Map 1 corroborated the idealistic and pedagogically naive nature of their entry-level schemata that were revealed in the item analysis: "very basic" (Kent), "idealism" (Kent), "teaching views I had as an undergraduate" (Greg), "starry-eyed goals without knowledge how to achieve them" (Greg), "naive" (Sue, Beverly and Nick), "philosophical" (Jack), "surface level" (Dan), "simple" (Beverly), "confused" (Jon), and "abstract, there were no students and no subject matter" (Bart).

Carol's reflection on her first map further underscores her naive entry-level schema of teaching.

> The first map is really of someone who didn't have much experience teaching. This came from someone who cared about kids, who enjoyed junior achievement teaching, and who enjoyed Sunday School teaching, but did not know what it was like to be in front of a class five hours per day, and do lesson plans, and grade papers. So this first [map] probably came straight from the heart.

Stage 2: Theoretical Schemata

By the end of the first summer of education coursework and related experiences, the cohort of preservice teachers developed schemata that were theoretically informed. Greg, Molly and Larry in particular acquired a theory-based vocabulary to construct their second concept map. When asked about his second map, Greg noted that

> I [developed this second map] . . . mostly from the summer. Because that is where my increased awareness of teaching came from. I was coming in green with only my perspectives of being a high school or middle school student back ten years ago. I think it was definitely this summer that has created this perception of . . . teaching.

Though Molly's first map contained fewer items than other members of the cohort, her second map was clearly grounded in theoretical pedagogy given to her in the education courses. Words emerging on her second map included "group work," "peer and cross age tutoring," "cooperative team learning," and "learning styles."

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These same items were also listed on Larry's second map.

Over the first summer of the program the cohort also began to develop a shared pedagogical vocabulary and a collective consciousness of teaching. For example, items shared most often by participants were "motivation" (4 maps), "cooperative team learning" (5 maps), "direct instruction" (7 maps) and "teaching styles" (9 maps). None of these items were contained on their first set of maps. Other items commonly listed included "teacher" (9 maps), "learning" (11 maps) and "student" (12 maps). Collectively, these items suggest that after the first summer of the program, preservice teachers as a group were more aware of the principles of teaching and had become sensitized, albeit on an academic level, to the interplay between teachers, students and learning.

Though still lacking classroom experience, preservice teachers were pedagogically informed and were more sensitive to student needs, learning styles and teaching styles as they began the fall semester. The effect of the coursework during Phase One clearly influenced both their thinking about teaching and their pedagogical vocabulary. Preservice teachers' descriptions of their second maps supported the theoretical nature of Stage 2: "more theory" (Kent), "complexity of teaching" (Greg), "theoretical detail" (Jarod), "more intellectual" (Sue), "intellectual framework" (Nick), "enlightened" (Beverly), and "a lot more theory" (Jon).

Stage 3: Integrated Schemata

As the cohort completed the extensive practicum in the schools during the fall semester and as they completed more education

The development of coursework during this same time, their schemata became more integrated; the theoretical knowledge of the university context became integrated with the practical knowledge of the school context. Preservice teachers were using principles of teaching to plan and deliver lessons as they were assimilating the conventional wisdom of the classroom.

For example, in his personal journal, Greg relates his willingness to integrate the principles of teaching he obtained in the program with his classroom instruction during the practicum:

> In the 7th grade class I taught a comparison lesson between the U.S. and Japan. It went great. I had pictures that [my methods professor] gave me that not only captured student attention, but also provided valuable insights of Japan. I even checked for understanding. [My mentor teacher] was pleased and so was I. It is amazing how good you feel after a lesson that accomplishes its objectives.

"Student attention," "checked for understanding" and "objectives" are evidence of the pedagogical knowledge Greg obtained during the first summer of the program.

As another example, Kent used Taba's Concept Formation Model from his social studies methods course to present lessons during his practicum teaching.

> I decided I wanted to use Taba because I wanted to experiment with it and see if I could use it. I wasn't certain what the kids would come up with for an example of conflict, so I wanted to get a broad range of examples. And I wanted to see if students could do the manipulations of data, and put them

into categories.

Concept acquisition was also part of Carol's math lesson during the practicum. In a stimulated recall interview, she noted

> I really like the exercise we did this summer [on concept acquisition], the exercise of, "Can you come up with a definition on your own?" And I thought polygons was a good one to do that with. So, since September when I knew I had to do this chapter I knew that I wanted to use concept acquisition.

The school classroom experiences of the fall practicum, then, fostered preservice teachers' awareness of learners and of the school milieu that appeared on their third maps. Examples of words on Map 3 that suggested this awareness were "real world" (Greg), "understanding students" (Molly), "extracurricular concerns" (Larry), "nuts and bolts of classroom operations" (Kent), and "other teachers" (Carol). Given that preservice teachers were more aware of the school context by the time they developed their third maps, and given that they had acquired theoretical knowledge of teaching, preservice teachers' schemata had become more realistic in terms of classroom expectations and more integrated in terms of bringing together theoretical with practical pedagogical knowledge.

When describing their third maps, preservice teachers tended to use words that were more practical: "more realistic" (Kent), "more practical" (Molly), and "beginning to see the light of education" (Jon). Bill noted that Map 3 "was definitely after being with the junior high kids [in the practicum]." Kent noted that his third map represented "the complexity of the classroom."

Perhaps Greg's description was the most accurate when he noted that Map 3 was "a combination of summer and fall." One way of interpreting Greg's description is a combination of theory and practice.

Stage 4: Practical Schemata

By the final weeks of student teaching, preservice teachers' thinking was more sophisticated and complex. The fourth set of concept maps collected toward the end of student teaching revealed that preservice teachers were beginning to make discriminations between features of their classroom environment. For example, on his fourth map Greg discriminated between long term and short term planning, and Larry discriminated between various types of learning. None of the preservice teachers' first maps contained such discriminations. Moreover, the practical view of teaching that emerged in their third maps and in the stimulated recall interviews of early student teaching were more apparent by late student teaching. Hence, the most notable restructuring of schemata occurred by the end of Stage 3. In Stage 4, preservice teachers' schemata were being finely tuned to their classroom contexts (see Figure 2).

Though most preservice teachers' schemata in Stage 4 appeared to be primarily practical, and though the cohort's fourth maps were mostly lacking the theoretical concepts that predominated Map 2 and that were partly present in Map 3, theoretical knowledge was nonetheless part of their fourth maps, though on a deeper level. For example, Jack, another member of the cohort, noted that

> some of the more academic things we learned over the summer

become incorporated without thinking about them. So that learning styles of the students and teaching styles isn't something that is up on your mind, but informs a lot of the other aspects of your teacher being. It becomes more of a background idea on different learning styles. In part, as a day to day teacher, you don't have time to worry about that on a continuing basis. You try to judge, to design lessons, that will hit a variety of different learning styles.

Kent and Bart revealed similar notions.

Kent: The material on the second map appears to be lost on the third [and fourth maps], but nevertheless it is in there, but just buried.

Bart: The theory does influence my daily decision making in that my theory does eliminate some of my decisions for me. What I am teaching has already been influenced by theory, so it is not a decision I have to make over and over everyday.

Deeper levels of awareness and understanding of teaching was also revealed by Molly as she described her fourth map.

I am really part of all these [words on my fourth map]. And it is not just words, or ideas. It is like this is me. But it is not enough. It is unfinished. I think I could add a thousand branches off of it. Because there is so much more to say about each one of these.

Hence, the pedagogical naivete that collectively permeated preservice teachers' schemata at the beginning of the program was replaced with pedagogical wisdom of the classroom and a practical, more concrete perspective of teaching. Underlying this practical

The development of perspective for many members of the cohort was an edifice of theoretical pedagogical knowledge that was acquired during the forepart of the alternative program. About their fourth maps the preservice teachers noted: "confident" (Beverly and Jon), "more balanced" (Jarod), "my needs and students' needs" (Sue), "more realistic" (Sue), "greater depth of thought" (Dan) and "refined and sophisticated" (Beverly).

In sum, Stage One schemata were idealistic; they were also pedagogically naive: lacking was an awareness of students' classroom needs and a vocabulary indicative of both theoretical and practical pedagogy. Preservice teachers were unaware of what students do in the classroom, and they were theoretically and technically uninformed about teaching when they entered the program. Stage Two schemata were theoretical; preservice teachers had acquired theoretical knowledge about teaching and they were academically informed. However, lacking classroom experience, Stage Two schemata for preservice teachers were still impractical. Stage Three schemata were restructured and pedagogically integrated. The theoretical knowledge they had about teaching was synthesized with practical knowledge of the classroom and with their personal constructions of teaching. Stage Four schemata were realistic, concrete, and pedagogically sophisticated. Termed "practical," these schemata implied idiosyncratic perspectives of teaching that members of the cohort developed throughout the program, particularly during student teaching.

Implications

The findings of this study can be examined for their

The development of implications for teacher education in general, and for alternative teacher education and graduate-level preservice teachers in particular. First, as graduate-level preservice teachers entered the program, they were professionally uninformed about students and the school milieu, and they were unaware of how to prepare and present lessons to a heterogeneous classroom of learners. The disparity between their entry-level awareness of teaching and the realities of the classroom was great. These findings suggest that policies waiving professional teacher preparation before preservice teachers enter the classroom should be challenged (see also Berliner, 1987; see also Grossman, 1989). Had preservice teachers in this study entered the classroom lacking either the coursework or the supervised field experiences, they would have been unaware of classroom dynamics in general and of learners' needs in particular.

Second, the data reinforce the need to help preservice teachers construct an initial cognitive framework of theoretical knowledge early in their pedagogical development. Though by the end of student teaching preservice teachers in this study no longer depicted their teaching as theoretical, they nevertheless indicated that the principles of teaching acquired earlier in their program were still part of their repertoire of teaching strategies. It appears, then, that theoretical knowledge acquired early in the program comprised part of preservice teachers' cognitive framework for planning and teaching. Preparation programs that include an initial framework of theoretical knowledge may promote the routinization of this knowledge during field experiences.

Third, this study provided compelling evidence that alternative teacher education programs grounded in conceptual frameworks that define clearly the scope and sequence of the pedagogical knowledge given to preservice teachers will increase the likelihood of being able to chart the growth of that knowledge in preservice teachers over time. As preservice teachers in this study interacted with their alternative program, they exhibited four stages of pedagogical development. These stages aligned with the program's curriculum that was designed in part to synthesize theoretical with practical knowledge of teaching. Subsequently, preservice teachers developed schemata that had conceptual depth and were pedagogically integrated. Alternative teacher education programs that lack conceptual frameworks may be unaware of what pedagogical knowledge preservice teachers are acquiring and using as they become teachers. Moreover, programs that lack articulation and coherence might foster the development of schemata in preservice teachers that also lack articulation and coherence.

Fourth, on a theoretical level, the model of schema development that emerged from the data suggests at least three sources of knowledge contribute to pedagogical development of graduate-level preservice teachers: (1) theoretical principles of teaching, (2) practical knowledge and wisdom of teaching and (3) personal prior knowledge of teaching. Programs that fail to acknowledge these sources might be fostering teaching perspectives that could be impractical and atheoretical. What seems desirable, then, is to design alternative preparation programs that emphasize each source of knowledge. Programs so designed may foster the

The development of growth of well-developed pedagogical schemata in their preservice teachers.

Though this study was not on a typical teacher preparation program nor on a traditional sample of preservice teachers, it nonetheless provided a glimpse of the pedagogical development in one group of alternative preservice teachers. A better understanding was gained of how a graduate-level, alternative certification program provided its preservice teachers with a pedagogically integrated view of teaching, a view that had its roots in principles of teaching and learning, in the practical knowledge and wisdom of the classroom, and in personal perspectives of teaching.

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APPENDIX A

STIMULATED RECALL INTERVIEWS

I. Planning

(a) How did you plan the lesson?

(b) What did you think about as you planned the lesson?

(c) What factors influenced your plans?

II. Teaching

A. CIS # 1

(a) What were you thinking at that point in the lesson?

(b) Was there anything else you thought of doing at that point but decided against it? Explain.

B. CIS # 2

(a) What were you thinking at that point in the lesson?

(b) Was there anything else you thought of doing at that point but decided against it? Explain.

C. CIS # 3

(a) What were you thinking at that point in the lesson?

(b) Was there anything else you thought of doing at that point but decided against it? Explain.

III. Post Lesson Reflections

(a) What stands out in this lesson?

(b) What are the lesson's strengths?

(c) How did you change your plans as you taught the lesson? Why?

(d) What revisions do you plan for tomorrow's lesson?